A VEGETATION INVENTORY OF A TRADITIONAL SECONDARY FOREST (*MUYONG*) IN KINAKIN, BANAUE, IFUGAO, NORTHERN LUZON, PHILIPPINES

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ABSTRACT

Traditional forest (*muyong*) has been recognized as a beneficial component of the rice terraces landscape of Banaue, Ifugao. It supplies irrigation water for the rice paddies (*payoh*); it provides firewood, timber, medicine and food for the locals; and it shelters various kinds of wildlife species. Threats have been reported to some *muyong* mainly due to anthropogenic activities and natural causes. Hence, protection of its biodiversity is important to sustain its ecological function and even its socio-cultural value. This study provides a botanical checklist of a *muyong* patch in Brgy. Kinakin, Banaue, Ifugao. A total of 52 woody species ($\geq$ 3 cm DBH; $\geq$ 2 m height) representing 40 genera and 31 families were recorded from the ten 10 m x 10 m quadrats. The most represented families were Euphorbiaceae, Fabaceae, Myrtaceae and Phyllanthaceae while the most represented genera were *Macaranga*, *Ficus*, *Syzygium*, and *Desmodium*. There were eight species categorized as endemic to the Philippines and one species [*Alnus japonica* (Thunb.) Steud.] considered as introduced to the *muyong*. Also, there is one species (*Macaranga caudatifolia* Elmer) listed as threatened species in the Philippines. The dominant woody species in the *muyongs* were *Clethra tometella* Rolfe ex Dunn. (*umog*), *Weinmannia luzoniensis* Vidal (*tabangawen*), *Calophyllum soulattri* Burm. f. (*bitaor*), *Lithocarpus submonticolus* (Elmer) Rehder (*palayon*) and *Macaranga caudatifolia* Elmer. (*bayyakot*). In general, the observed floral composition of the *muyong* showed a close resemblance to the tropical lower montane forest formations of the Philippines.

KEYWORDS: Secondary montane forest, Banaue, muyong, vegetation composition, dominant species

INTRODUCTION

Secondary forests constitute 83% of the Philippine forests. This forest type can be categorized mainly into post-extraction secondary forests and swidden fallow secondary forests (Lasco *et al.*, 2001). One example of

swidden fallow secondary forests is the traditional forest of Ifugao locally known as *muyong* (Lasco *et al.*, 2001). Butic and Ngidlo (2003) regard this forest as one component of the rice-based terrace cultivation system (*muyong* system) of the Ifugao. It is a natural stand of vegetation complimentary to the farming activities in the rice terraces (*payoh*) (Madulid, 2010). Moreover, it is forest patch that provides timber, fuel, food and medicine to the local communities (Butic and Ngidlo, 2003). History, nature, customary laws, uses, maintenance, and threats associated with the *muyong* have been documented by Serrano and Cadaweng (2005) and Madulid (2010). Madulid (2010) also cited many researchers who worked on anthropology, linguistics, forest silviculture and management, and ethnobotany of the *muyong*.

Botanical inventories of the *muyong* have been made since the 1960s but these accounts have yet to be updated. Klock (1993), as cited by Madulid (2010), reported 300 species of vascular plants in Burnay and Luta, Ifugao. In the study of Rondolo (2001), although no particular site in Ifugao was provided, 264 species of plants were recorded from 67 plots (25m x 25m). Pictorial enumeration of plants in the *muyong* was recently accomplished by Madulid (2010) but limited only to noteworthy and useful species. The most recent inventory of tree species in Banaue, Ifugao was conducted by Baguinon and Miel (2013) in Brgy. Poitan.

This study aims to assess another *muyong* patch located in Brgy. Kinakin, Banaue, Ifugao. The specific objectives are to: a) provide detailed updated checklist of woody plants found in Brgy. Kinakin; b) to evaluate the composition and distribution of plant species; and c) to determine the dominant species of woody plants and the forest affinity of the *muyong*. This initial research is part of a broader investigation of biodiversity, nutrient dynamics and agricultural productivity of the *muyong* system. Nonetheless, findings of this study will complement the rich traditional knowledge of Ifugao. This will also add more information to the works of Baguinon and Miel (2013) which will be necessary for biodiversity protection and conservation of the traditional forests or *muyong* of Banaue, Ifugao.

MATERIALS AND METHODS

Study Area. Banaue is one of the UNESCO heritage municipalities of Ifugao. It is geographically located at 16°55' N and 121°03' E (Fig. 1). It is bounded by the municipality of Mayoyao to the east; Hingyon to the south; Hungduan to the west; and Mt. Province to the north. The climate of Banaue can be divided into two major seasons based on rainfall and temperature patterns: (a) rainy season, from May to November; and (b) dry season, from December to April (Roger *et al.*, 1986). Its average annual rainfall is 3688 mm. The cooler months (less than 20 ^{o}C) commence in November and ends in February. The warmest month of the year is May (approximately 23 ^{o}C). On

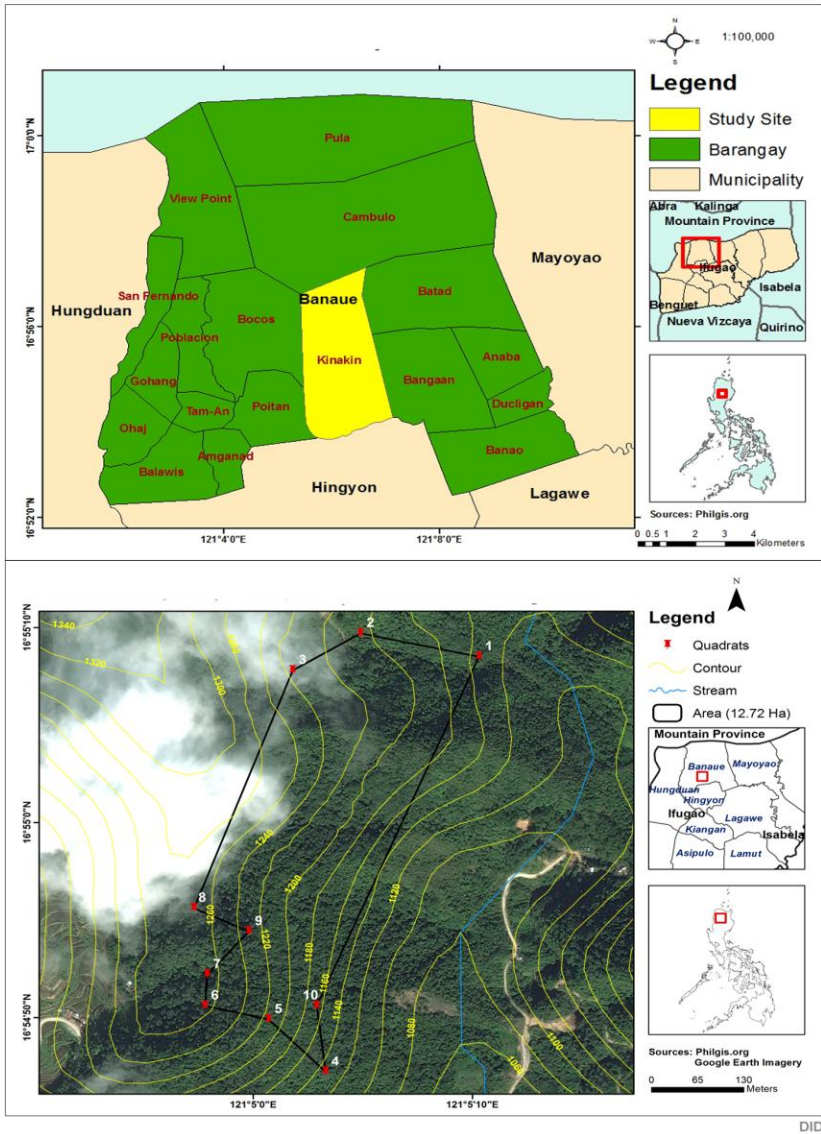

Figure 1. Maps showing the location of the study area (A) and the 10 sampling plots (B).

the average, its annual temperature is 21.3 ^{o}C (Settele and Martin, 1998), which is a typical warm condition of high altitude tropical rainforest.

Plant Inventory. The plot method (Mueller-Dombois and Ellenberg, 1974) was used in characterizing the vegetation. In each site, a 10m x 10m

plot was laid for the inventory of woody plants. All trees with a height greater than two meters and a stem diameter of at least three cm at breast height were considered. Taxonomic information about each plant sample were verified from published sources authored by Pancho (1983), Rojo (1999) and Pancho and Gruezo (2006, 2009). On-line databases generated by the group of Pelser, Barcelona and Nickrent (2001) and that of tropicos.org (2013) were also consulted. Nomenclature followed the latest Angiosperm Phylogeny Group classification (Stevens, 2001).

Dominance Analysis. The dominating woody species for the whole study area were determined using Importance Value (IV) given as (Causton, 1988):

$$\text{IV} = \frac{\text{Relative Density (RD)} + \text{Relative Basal Area (RBA)} + \text{Relative Frequency (RF)}}{3}$$

where:

$$\text{RD} = \frac{\text{number of individual of species } X \text{ in all quadrats}}{\sum \text{number of individuals of all species in all quadrats}} \; x\, 100$$

$$\text{RBA} = \frac{\text{basal area of species } X \text{ in all quadrats}}{\sum \text{basal areas of all species in all quadrats}} \; x\, 100$$

$$\text{RF} = \frac{\text{frequency of species } X \text{ in all quadrats}}{\sum \text{frequency of all species in all quadrats}} \; x\, 100$$

RESULTS AND DISCUSSION

Vegetation composition and distribution. A total of 52 woody plant species were recorded in the ten 10m x 10m quadrats established in *muyongs* located at Brgy. Kinakin, Banaue, Ifugao. Of this record, 40 trees were identified to species level, five trees to genus level and one tree to family level (Table 1). There were six tree species that were not taxonomically identified.

The most represented family is Euphorbiaceae (11%) (Fig. 2).Similarly, this family was also noted as the most common family in the *muyong* inventory conducted by Rondolo (2001) and Baguinon and Miel (2013). Euphorbiaceae is followed by Fabaceae (7%), Myrtaceae (7%) and Phyllanthaceae (7%). These four families are pantropical rainforest families (Wurdack *et al.*, 2004; Primack and Corlett, 2005; Cadiz, 2009). Euphorbiaceae (the spurge family) is represented by *Acalypha angatensis* Blanco, *Homalanthus alpinus* Elmer, *Macaranga caudatifolia* Elmer, *Macaranga dipterocarpifolia* Merr. and *Mallotus mollissimus* (Geisel.) Airy Shaw. On other hand, Fabaceae (or *Leguminosae*, the legume family) is

represented by *Archidendron clypearia* var. *casai* (Blanco) Nielsen, *Desmodium* sp. and *Desmodium sequax* Wall. Myrtaceae (the myrtle family) is represented by three species, *Decaspermum fruticosum* JR and G Forst and two *Syzygium* sp. Lastly, Phyllanthaceae (formerly included in Euphorbiaceae), is represented by three species namely *Bischofia javanica* Blume, *Breynia cernua* (Poir.) Mull. Arg. and *Bridelia glauca* Blume (Wurdack *et al.*, 2004). It is also interesting to note that some species belong to the plant families mainly in the temperate regions such as Ericaceae, Fagaceae and Lauraceae (Buot and Okitsu, 1998). Moreover, the less represented families include Pentaphylacaceae, Melastomataceae, Moraceae, and Rubiaceae. These four families accounted for 24% of the recorded families, and each family was represented by two species (Fig. 2). Pentaphylacaceae (the pentaphylax family) has paleotropic distribution (Watson and Dallwitz, 1992) while Melastomataceae are mostly tropical (Fernando, 2007; Watson, and Dallwitz, 1992). Meanwhile, Moraceae (the fig family) and Rubiaceae (the coffee family) are common tropical rain forest families (Primack and Corlett, 2005; Watson and Dallwitz, 1992).

The remaining 49% is apportioned to 23 families, each represented by one genus. This includes temperate families (Adoxaceae and Betulaceae), temperate to tropical families (Actinidiaceae, Cunoniaceae, Elaeocarpaceae, Ericaceae, Proteaceae, Staphyleaceae, Vitaceae, Lauraceae, Pittosporaceae), pantropical family represented by Cyatheaceae and families with widespread distribution (Calophyllaceae, Clusiaceae, Clethraceae, Fagaceae, Hydrangeaceae, Malvaceae, Primulaceae, Rosaceae, Rutaceae and Thymelaeaceae (Fernando, 2007; Watson, and Dallwitz, 1992).

The most represented genera with at most two species each are *Macaranga*, *Ficus*, *Syzygium* and *Desmodium* (Fig. 2). Species of *Macaranga* are distributed from West Africa to the South Pacific Islands and usually located in the secondary forest and forest gaps (Davies *et al.*, 1998; Primack and Corlett, 2005). Species of *Ficus* are mostly found in the tropical region although there are other members of this genus that can be found in temperate regions (Jones and Luchsinger, 1979). In addition, *Ficus* is characteristic species usually found in disclimax ecosystems (Lambio, 2007). On the other hand, members of the genus *Syzygium* are widely distributed throughout Africa, mainland Asia, Malesia, Australia, New Zealand and the western Pacific (Primack and Corlett, 2005). *Desmodium* species have diverse distribution pattern (Ohashi, 2004). However, the latter species are mainly native to the tropics and subtropics (Heider *et al.*, 2009).

Out of the 40 identified woody species, eight (20%) are endemic to the Philippines namely *Clethra tomentella* Rolfe, ex Dunn (Clethraceae), *Garcinia* vidalli Merr. (Clusiaceae), *Weinmannia luzoniensis* Vidal (Cunoniaceae), *Vaccinium whitfordii* Merr. (Ericaceae), *Homalanthus alpinus* Elmer (Euphorbiaceae), *Lithocarpus submonticolus* (Elemer) Rehder. (Fagaceae), *Astronia cumingiana* Vidal *var. bicolor* (Merr.) Maxw. and Veldk.

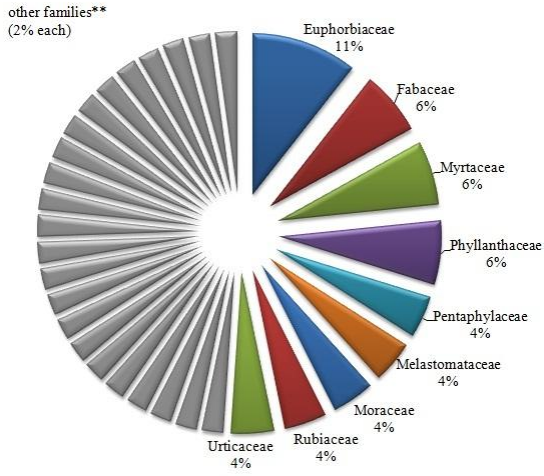

Figure 2. Proportion of the recorded families in terms of number of genera observed from the ten 10 m x 10 m quadrats established in the *muyongs* located at Brgy. Kinakin, Banaue, Ifugao, Philippines (excluding the unidentified species).

(Melastomataceae), and *Pittosporum ramosii* Merr. (Pittosporaceae). According to Balangcod *et al.* (2011), climatic and edaphic variations at short distances were evident in the area. These could lead to habitat fragmentation and species isolation leading to endemism in the site.

Interestingly, there was only one species (*Macaranga caudatifolia* Elmer.) included in the national list of threatened plants and also only under the category Other Wildlife Species (Fernando *et al*., 2008). However, one introduced species, *Alnus japonica* (Thunb.) Steud, locally called *arnos*, was recorded from the sampling area. According to Pelser, Barcelona and Nickrent (2011), *arnos* is extensively cultivated in the Cordillera highlands specifically in open and eroded sites. It was originally introduced as an ornamental plant in Baguio City in early 1990s by the Americans. Later on, it proliferated in the highlands of Cordillera including Ifugao as it was recommended as a reforestation species in the area (Baguinon *et al.*, 2005). This prolific and gregarious species tend to form pure stands in the gaps of lower and upper montane forests of the Cordillera Highlands. In Banaue, its stem is presently used in making furniture and producing charcoal (Madulid, 2010). Still, this

Table 1. List of **woody plants** (≥ 3 cm DBH) found in the ten 10 m x 10 m quadrats established in woodlots located at Barangay Kinakin, Banaue, Ifugao, Philippines and their geographical ranges of distribution.

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
ACTINIDIACEAE			
Saurauia polysperma (Blanco) Merr.	Chokwe	- (Tree)	Luzon: Ilocos Norte, Benguet, La Union, Nueva Viscaya, Pampanga. In primary forests, altitude 750-1400m (Pancho, 1983).
ADOXACEAE			
Viburnum odoratissimum Ker. Gawl.	Bongbongtit	Idog (Tree)	Burma, China, India, Japan, South Korea, Thailand, Vietnam, Philippines. In the Philippines, in alpine and subalpine, wooded regions (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011)
BETULACEAE			
Alnus japonica (Thunb.) Steud.	Arnos	Japanese Alder (Shrub or Small Tree)	NE China, South Korea, Japan, Taiwan, Russian Federation. Cultivated in Europe and elsewhere. Introduced in the Philippines (Luzon, Benguet). Extensively cultivated in the Cordillera highlands in open and eroded sites, altitude 1000-2400 m. (Orwa *et al*., 2009)
CALOPHYLLACEAE			
Calophyllum soulattri Burm. f.	Bitaor	Pamintaogan (Tree)	Mindanao, Batan Is., Mindoro, Busuanga, Palawan, Sibuyan, Ticao, Catanduanes, Guimaras, Negros, Luzon; Lowland and hill forests, swamp forests; In primary forests at low and medium altitudes, ascending to 1,200. m. Indo-China to the Mascarene Islands and Malaya (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011)

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
CLETHRACEAE			
Clethra tomentella Rolfe, ex Dunn	Umog	Ayusan	ENDEMIC. Luzon: Benguet, Nueva Viscaya, Rizal, Quezon, Laguna, Batangas; scattered in thickets or forests, chiefly on ridges in mossy forests, altitude 600-1800m (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).
CLUSIACEAE			
Garcinia vidalii Merr.	Bulon	Bili (Tree)	ENDEMIC; Luzon: Benguet, Pangasinan, Rizal, Laguna, Sorsogon; Sibuyan, Panay, Leyte, Samar, Mindanao. In primary forests at low and medium altitudes (Pancho, 1983).
CUNONIACEAE			
Weinmannia luzoniensis Vidal	Tabangawen	Bani; Itangan (Shrub or Small Tree)	ENDEMIC. Luzon: Ilocos Norte, Mountain Province, Benguet, Bataan, Rizal, Laguna, Quezon. Forests, altitude 600-1700m (Jukema *et al.*, 1991; (Pancho, 1983)
CYATHEACEAE			
Cyathea sp.	Tipanglan	- (Tree)	Pantropical (Fernando, 2007).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
ELAEOCARPACEAE			
Elaeocarpus bontocensis Merr.	Hawili	Kalumbaya	Luzon: Mountain Province, Bauco, in forests, altitude 1700 m (Pancho and Gruezo, 2006).
ERICACEAE			
Vaccinium whitfordii Merr	Gutmo	Katmo	ENDEMIC. Ilocos Norte, Abra, Bontoc, Ifugao, Lepanto, Benguet, Nueva Ecija, Mindoro, Negros, Leyte (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).
EUPHORBIACEAE			
Acalypha angatensis Blanco	Buluh		Taiwan to Polynesia; Batanes and N Luzon to Mindanao. In thickets, chiefly at medium altitudes, ascending to 1500m (Pancho and Gruezo, 2006).
Homalanthus alpinus Elmer	Buta-buta	Buta (Shrub or Small Tree)	ENDEMIC. Batan, Luzon: Abra, Mountain Province, Ifugao, Benguet, Nueva Vizcaya, Nueva Ecija, Quezon, Laguna, Rizal, Sorsogon, Catanduanes, Mindoro, Panay, Negros, Mindanao: Lanao. Common in thickets, on ridges, old clearings, etc. mostly above an altitude of 750m ascending to 2400m (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
Macaranga caudatifolia Elmer.	Bayyakot	Daha	
Macaranga dipterocarpifolia Merr.	Anablon	Amublit; Balumti (Tree)	Taiwan, Lanyu, Philippines. Luzon: Abra, Apayao, Benguet, Ilocos Norte, Tayabas, Nueva Ecija, Bataan, Laguna, Camarines, Sorsogon, Cebu, Leyte, Mindanao. Primary forests and forested ravines, altitude 400-1300 m (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011)
Mallotus mollissimus (Geisel.) Airy Shaw	Balanti	Hinlaumo (Shrub or Small Tree)	Tenasserim, Thailand, Sumatra, Peninsular Malaysia, Borneo, the Philippines, Sulawesi, Lesser Sunda Isls, Moluccas, New Guinea, NE Australia. Widespread in the Philippines in most islands and provinces, usually very common in second-growth forests at low altitudes, ascending to 2200 m (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011)
FABACEAE			
Archidendron clypearia var. *casai* (Blanco) Nielsen	Upitan	-	Peninsular Malaysia, Java, Borneo, Philippines. Batanes, Luzon (throughout), Mindoro, Palawan, Leyte, Camiguin, Mindanao. Lowland forests, most common in montane forests, exposed slopes and ridges to 2000 m (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
Desmodium sp.	Mugmugog	- (Shrub)	
Desmodium sequax Wall	Pulot	- (Shrub)	India, Himalayas, Myanmar, Indochina, China, Taiwan and Malesia: Sumatra, Java, Philippines, Sulawesi and New Guinea. LUZON: Kalinga, Mountain Province, Benguet, MINDANAO: Bukidnon, Davao. Montane thickets, ravines and forests, altitude 1200-2400m (Pancho and Gruezo, 2006).
FAGACEAE			
Lithocarpus submonticolus (Elmer) Rehder.	Palayon	Tapotas (Tree)	ENDEMIC. Luzon (common), Mindoro (rare), Mindanao: Davao (Mt Apo), Agusan del Norte (Mt Urdaneta). Forests, 1000-1700 m (Pancho, 1983).
HYDRANGEACEAE			
Deutzia pulchra Vidal	Hanahti	Kodai-bundok	Taiwan, Philippines. LUZON: Ifugao, Mountain Province, Benguet, Nueva Ecija. Commonly in the montane zone between 1200-2400m, in thickets, exposed ridges, ravines and clearings in the mossy forests (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).
LAURACEAE			
Machilus philippinensis Merr.	Angadien	Kulilisiau (Shrub or Small Tree)	Luzon: Mountain Province, Cagayan, Bataan, Laguna, Batangas, Quezon, MINDORO. Ridge forests, alt. 800-2300m (Pancho, 1983).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
MALVACEAE			
Sterculia rubiginosa Vent. var. *rubiginosa*	Holholot		Luzon: Ilocos Norte, Ilocos Sur, Mountain Province, Benguet, Cagayan, Isabela, Zambales, Bataan (Mt Mariveles), Rizal, Laguna, Quezon, Camarines, Albay, Polillo, Catanduanes, Palawan, Panay, Negros, Leyte, Mindanao, Basilan, Tawi-Tawi. Occupying a wide spectrum of habitat ranging from thickets and open secondary forests to primary forests, from near sea-level to 1600 m (Rojo, 1999; Pelser, Barcelona and Nickrent, 2011).
MELASTOMATACEAE			
Astronia cumingiana Vidal *var. bicolor* (Merr.) Maxw. &Veldk.	Talanak	Kalingai (Shrub or Small Tree)	ENDEMIC. Luzon, Mindanao; Primary forests, 300-2000 m (Pancho and Gruezo, 2006).
Melastoma malabathricum L.	Botki	Malatungao (Shrub)	India, Indochina through Malesia. Throughout the Philippines in dry shrubberies among grasslands at low and high altitudes (Pancho and Gruezo, 2006).
MORACEAE			
Ficus minahassae (Teijsm. & de Vr.) Miq.	Alimit	Hagimit (Tree)	Borneo, Sulawesi, Talaud Island, Philippines (Luzon, Polilio, Mindoro, Masbate, Panay, Negros, Cebu, Samar, Leyte, Mindanao, Basilan). In primary forests to 1,350 m alt., especially in damp places or along water courses (Fernando *et al*., 2004; Pancho, 1983)
Ficus ribes Reinw. ex Blume var. cuneata (Miq.) Corner	Piwis	Dungarug	Philippines (Bontoc, Benguet, Laguna), Sulawesi. Luzon, Mindoro, Samar, Mindanao. Forests at low altitudes (Pancho, 1983).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
MYRTACEAE			
Decaspermum fruticosum JR and G Forst.	Bortik	Patalsik (Shrub or Small Tree)	Burma, S China, across Malesia to tropical Australia. Throughout the Philippines, in all or most islands and provinces, in thickets and secondary forests, 0-2300m (Pancho and Gruezo, 2006).
Syzygium sp.	Angnge	-	
Syzygium sp.	Galit-on	-	
PENTAPHYLACACEAE			
Adinandra elliptica C. B Rob.	Mangalituba		Luzon: Benguet (Sablan; Baguio), Nueva Vizcaya, Nueva Ecija (Mt Umingan), Sorsogon, Mindoro: Mindoro Occidental (Mt Calavite), Panay: Antique, Negros: Negros Oriental (Cuernos Mtns), Mindanao: Misamis, Bukidnon (Mt Lipa), Davao (Mt Apo) (Pancho, 1983).
Eurya japonica Thunb.	Halinghingon	Japanese eurya (Shrub)	Batanes, Luzon: Ilocos Norte to Sorsogon, Mindoro, Negros, Mindanao: Davao. Mossy forests, exposed ridges and ravines, altitude 1000-2000m (Pancho, 1983).
PHYLLANTHACEAE			
Bischofia javanica Blume	Tower	Tuai (Tree)	India and the Himalaya to China, Taiwan, Southern Japan, Indo-China, Thailand and throughout Malesia, including the Philippines, and to NE Australia, Samoa and Tonga (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
Breynia cernua (Poir.) Mull.-Arg.	Chornowan	Matang-katang	Java, Philippines, Sulawesi, Lesser Sunda Isls, Moluccas, New Guinea and Australia. Batan and N Luzon to Palawan and Mindanao. Common in thickets at low and medium altitudes ascendi (Rojo, 1999; Pelser, Barcelona and
Bridelia glauca Blume	Putukan	Balitahan (Tree)	Java, Philippines (Bontoc, Benguet, Nueva Ecija, Quezon, Camarines, Leyte, Mindanao) (Rojo, 1999; Pelser, Barcelona and Nickrent , 2011).
PITTOSPORACEAE			
Pittosporum ramosii Merr.	Pow-hi	Albon (Shrub or Small Tree)	ENDEMIC. Luzon: Abra, Mountain Province. Forests, altitude c. 1500 m (Pancho, 1983).
PRIMULACEAE			
Maesa laxa Mez.	Laglagin	Tubang-aso (Shrub)	Widespread in SE Asia, occurring throughout the Philippines. Secondary forests, mossy forests, and upper pine forests; 100–2000 m (Rojo, 1999; Pelser, Barcelona and Nickrent, 2011).
PROTEACEAE			
Helicia sp.	Ulakton	- Tree	The genus is distributed in the Malesian region (Sleumer, 1956; Pancho, 1983).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
ROSACEAE			
Prunus grisea (Blume) Kalkm var. *girsea*	Atache	Lago (Tree)	Sulawesi, Lesser Sunda Isls, Moluccas, New Guinea. Also possibly Taiwan; Luzon, Mindoro, Palawan, Sibuyan, Cebu, Bohol, Leyte, Mindanao. Primary and secondary forests, mostly between 0-2500m altitudes (Fernando *et al*., 2004; Pancho, 1983).
RUBIACEAE			
Neonauclea calycina (Bartl. ex DC.) Merr.	Ti-om	Kalamansanai (Tree)	Myanmar, Indochina, Peninsular Thailand and Malesia: Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, N Borneo, Philippines (Luzon, most provinces, Polillo, Mindoro, Palawan, Ticao, Masbate, Panay, Negros, Leyte, Agusan, Basilan, Zamboanga). In primary and secondary forests at low and medium altitudes (Pancho and Gruezo, 2009).
NO ID 1	Lachao	-	
RUTACEAE			
Melicope acuminata (Merr.) TG Hartley	Ngayange	Tankapan	Luzon: Laguna, Camarines, Sorsogon. Lowland thickets or forests (Pancho and Gruezo, 2006).

Table 1 (*cont'd.*).

FAMILY / SPECIES	IFUGAO NAME	COMMON NAME (HABIT)	DISTRIBUTION
URTICACEAE			
Maoutia setosa Wedd.	Lai	- (Shrub)	Ryukyus, Lanyu, Lutao and the Philippines. N Luzon to Mindanao. Forests and thickets, in some regions at low and medium altitudes; ascending to 2200m in Benguet (Rojo, 1999; Pelser, Barcelona and Nickrent, 2011).
VITACEAE			
Leea aculeata Blume ex Spreng.	Anga-ang	- (Shrub or Small Tree)	Sumatra, W Java, Borneo (SE Kalimantan, Sarawak, Sabah), Philippines, Sulawesi (N & SE Peninsulas), Moluccas (Talaud, Seram, Ambon), New Guinea (Irian Jaya). A rather interesting distribution pattern with the species exceedingly common in the Philippines but apparently very rare over the SW part of its range to Sumatra. Mainly secondary vegetation, particularly riverine areas from near sea-level to 1300m (Pancho and Gruezo, 2006).

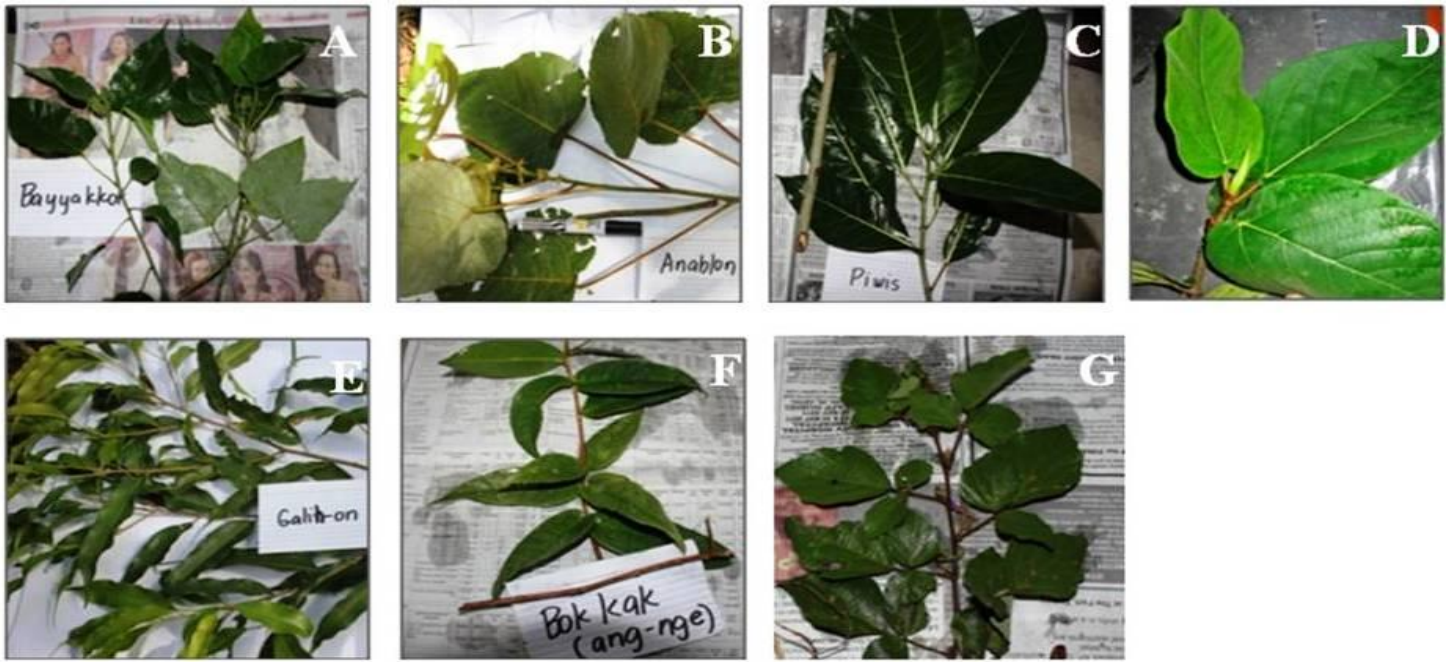

Figure 3. Most represented genera from the 10 quadrats established in the woodlots located at Brgy. Kinakin, Banaue, Ifugao: (A) *Macaranga caudatifolia* Elmer.((B) *Macaranga dipterocarpifolia* Merr.; (C) *Ficus ribes* Reinw. ex Blume var. cuneata (Miq.); (D) *Ficus minahassae* (Teijsm. & de Vr.) Miq (image by Rule, 2013). (E) *Syzygium* sp. (F) *Syzygium* sp.; (G) *Desmodium sequax* Wall; and (H) *Desmodium* sp.

Table 3. Ten woody species (> 3 cm DBH) with the highest importance value sampled from the muyongs located at Brgy. Kinakin, Banaue, Ifugao, Northern Luzon, Philippines.

RANK	SPECIES	ABSOLUTE DENSITY (trees /sq. m)	RELATIVE DENSITY	ABSOLUTE BASAL AREA (cm^2)	RELATIVE BASAL AREA	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY	IMPORTANCE VALUE
1	*Clethra tomentella*	0.680	22.667	260.714	1.580	6.000	4.615	9.621
2	*Weinmannia luzoniensis*	0.200	2.000	1811.525	10.980	4.000	3.077	5.352
3	*Calophyllum soulattri*	0.190	5.000	507.761	3.078	6.000	4.615	4.231
4	*Lithocarpus submonticolus*	0.150	6.667	350.745	2.126	5.000	3.846	4.213
5	*Macaranga caudatifolia*	0.130	2.667	827.419	5.015	6.000	4.615	4.099
6	*Machilus philippinensis*	0.100	2.667	738.424	4.476	5.000	3.846	3.663
7	*Eurya japonica*	0.090	6.333	142.618	0.864	4.000	3.077	3.425
8	*Vaccinium whitfordii*	0.080	4.333	466.528	2.828	4.000	3.077	3.413
9	*Wikstroemia ovata*	0.080	2.000	786.739	4.769	4.000	3.077	3.282
10	*Adinandra elliptica*	0.080	3.000	447.513	2.712	5.000	3.846	3.186

could potentially be bio-invasive species in the area as emphasized by Baguinon and Miel (2013).

Vegetation Dominance and Affinity. The ten species with the highest importance value (IV) is shown in Table 2. The high IV of *Clethra tomentella* Rolfe ex Dunn. (*umog*), an endemic species, is attributed to its high density (0.68 trees per sq. m.) and was present in six out of 10 quadrats. On the other hand, *Weinmannia luzoniensis* Vidal (*tabangawen*), also an endemic species showed the highest basal area (1811.525 sq. cm.) among all woody species. Moreover, these species were continuously utilized and propagated by the *muyong* owners (Madulid, 2010). *Umog*, for example, is primarily used as fuelwood and material for house construction while *tabangawen* is used for housing construction, handicraft and source of lumber and furniture (Ngohayon *et al*., 2010). Similarly, the wood of *Calophyllum soulattri* Burm. f. (*bitaor*) and *Lithocarpus submonticolus* (Elmer) Rehder (*palayon*) is used for lumber and house construction (Madulid, 2010).

Lastly, the results of vegetation inventory revealed close affinity of the *muyong* to the lower montane forest formation of the Philippines. It resembles the vegetation of Balbalasang-Balbalan National Park in Kalinga Province at an elevation range of 800 to 1800 masl (Malabrigo, 2013), also characterized as lower montane forest. In addition, woody species common to this type of forest include *Clethra, Vaccinium, Lithocarpus, Cyathea, Syzygium* among others (Malabrigo, 2013; Cadiz, 2009; Buot and Okitsu, 1998) which were also observed in the *muyongs* of Banuae, Ifugao.

CONCLUSION AND RECOMMENDATION

The dominance of endemic species attests the acceptable conservation status of vegetation in the *muyong*. Possibly, the habitats of these endemic species are still intact. Alternatively, this can be attributed to owners' indigenous knowledge and practices of *muyong* conservation. However, the presence of threatened and exotic species necessitates protection and conservation measures of the muyong. A community based biodiversity education program could be initiated to communicate the importance of endemic species and the threats from exotic species. As a swidden fallow secondary forest, current assisted natural regeneration practices must be maintained and promoted particularly reforestation using endemic species.

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